STANDARD

PROCEDURE

G-6300

PROGRAM: Standard Work Aids

PROJECT: Cost Estimating

SUBJECT: IPAO Cost Estimate Sufficiency Report (SR)

Authorized by: _____

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Dated on _____

Total Pages 9

1.0 PURPOSE

1.1 The purpose of this Standard Procedure is to provide a checklist to review project office cost estimates (or the project's cost estimates – if a project office does not formally exist) for reasonableness, completeness, consistency, and compliance with generally accepted estimating processes. The end result of the sufficiency report is to provide decision makers with an assessment on the quality of the cost estimate.

2.0 SCOPE

2.1 The standards for which the IPAO cost estimators look:

2.1.1 **Traceability.** Information presented in a traceable fashion containing supporting documentation and technical data. IPAO cost estimator must be able to trace with the given information.

2.1.2 **Reasonableness.** Information presented in a logical manner with appropriate analogies and cost estimating relationships (CERs).

2.1.3 **Soundness**. Information, assumptions, and recommendations presented must be sound arguments. IPAO cost estimator will carefully consider expert judgments or assumptions.

2.1.4 **Verification.** Information presented must be verifiable by the IPAO cost estimator. The IPAO cost estimator will check databases that were used to verify the technical parameters on the cost elements.

2.1.5 **Validity.** Information presented must be logically correct, justifiable, and well-grounded. The IPAO cost estimator will review the groundrules and assumptions.

2.1.6 **Accuracy/Consistency**. Information presented is well organized, cohesive, supportable, and easily understood.

2.1.7 **Completeness**. Information presented must contain all necessary data, assumptions, and pertinent information.

2.2 The scope has to be sufficiently broad to allow the IPAO to be able to replicate the estimator's work given the same set of facts from the Project Office.

3.0 REFERENCE DOCUMENTS

3.1 **Society of Cost Estimating and Analysis Glossary of Terms Version 1.0**

4.0 DEFINITIONS AND ACRONYMS

4.1 Definitions

4.1.1 Cost Estimating

1) The art of approximating the probable Cost or value of something, based on information available at the time. 2) The art of predetermining the lowest realistic cost and price of an item or activity which assure a normal profit. See Cost Estimating Methods and Cost Estimating Process.

4.2 Acronyms

4.2.1 IPAO - Independent Program Assessment Office: The IPAO is a headquarters office located at Langley Research Center (LaRC). The IPAO role in cost estimating is to provide leadership and strategic planning for the cost estimation core competency by: interfacing with the Agency CFO and the Office of the Chief Engineer (Code AE) at NASA Headquarters regarding cost analysis requirements and processes, providing instruction on cost tool use, developing specialized cost tools, ensuring consistent, high-quality estimates across the Agency, fostering a "pipeline" of competent NASA analysts, providing independent, non-advocate cost estimates and cost-benefit analyses, and chairing the Cost Estimating Working Group and the annual NASA Cost Symposium Workshop.

4.2.2 WBS -Work Breakdown Structure: A technique for representing all the components, software, services and data contained in the project scope statement. It establishes a hierarchical structure or product oriented "family tree" of elements. It is used to organize, define and graphically display all the work items or work packages to be done to accomplish the project's objectives.

5.0 RESPONSIBILITIES

6.0 METHODS, METHODOLOGIES, OR SPECIFICATIONS

6.1 Documentation caveats:

6.1.1 Don't give a point estimate, give a cumulation distribution.
6.1.2 A CARD (Cost Analysis Requirements Document) is not a collection of references.
6.1.3 Document sufficiently so that the reviewer can assess the project to the same standards as you the coster.
6.1.4 Remember that the reviewer has to be able to be able to discern and estimate the same object that you are.

6.2 Software Costing Tools that are currently in use.

6.2.1 PRICE
6.2.2 SEER
6.2.3 ACE-IT
6.2.4 NAFCOM
6.2.5 We are also talking about building our own database of information so that we can use more accurate information to determine our costs at our own location.

6.3 Scheduling Tools that are currently in use.

6.3.1 MsProject (Preferred)
6.3.2 Primavera
6.3.3 Artemis

7.0 FLOW CHARTS/MAPS

8.0 PROCEDURE

8.1 How the IPAO cost estimators assess cost estimates:

8.1.1 **Receive the project cost estimate from the project office.** What constitutes "project cost estimate": documentation that contains the numeric tables with all supporting narrative (in softcopy).

8.1.2 **Check the administrative information.** Who prepared the estimate? For what purpose was the project office estimate generated? How much effort (staff months) did it take to do the estimate? What was the cost estimating schedule? Is this estimate a new estimate or an update of a prior estimate? Has anyone else reviewed this estimate or the prior estimate and what were the findings?

8.1.3 **Review of the presence of the cost estimate documentation.** This is to verify that in fact there are adequate "materials" to conduct the sufficiency review. Is the documentation organized according to the WBS—if not, a logical manner that will provides structure for the IPAO cost estimator to follow. Are prior costs documented? Are the narratives explaining the estimating methodologies understandable? Are there pertinent historical information and project funding data? Are there supporting data or documentation available for those elements requiring further verification? Are

the WBS definitions available? Can the IPAO cost estimator "replicate" what was done in the project office estimate—from the documentation?

8.1.4 **Assuming a reasonable level of documentation is present, the next step is to conduct the traceability from the final cost estimate "rolled-up" number to the appropriate level that show the basis of the estimate.** The IPAO cost estimator will select a cost element and "drill down" to the basis of the estimate. The drill down process depends on the cost element and how it is "bucketed" and "estimated." Generally, the estimator will literarily track the number from one spreadsheet or chart to another and in the process "decompose" the summation number until we reach a satisfactory level where the estimate is understood.

8.1.4.1 As a guideline, the IPAO cost estimator will target the high cost, high risk, and high interest cost elements. Depending upon the project, this may fall into the 80/20 rule, where 80% of the cost resides in 20% of the cost elements.

8.1.4.2 Which cost elements are "pass through" elements?

8.1.4.3 Once the cost elements are selected, the IPAO cost estimator will drill down each element tailored to its component or system.

8.2 **There are many questions an estimator can ask to understand the cost estimate**.

8.2.1 These are suggested questions to be asked in a drill down exercise—this is not an inclusive list:

a. Are the costs rational to prior actual costs?

b. Are the ground rules and assumptions reasonable?

c. Are the learning curve (if applicable) and slopes reasonable?

d. Were historical data used?

e. Were correct inflation rates used?

f. Were appropriate methods used? Is the estimate reflecting analogies and databases that are within realm of reasonableness, such as technology, platforms, etc?

g. Are the data points/range used in the cost estimate relevant?

h. Are all pertinent costs included?

i. Are costs time-phased over the fiscal years? Both inflated and non-inflated dollars?

j. What is the method of time-phasing the point estimate? Is the project schedule consistent with cost estimate schedule used in the phasing?

k. Were analogous direct and overhead rates used?

l. Did the estimate capture applicable full cost?

m. Is appropriate cost/risk analysis performed? Did the estimate capture the risks?

n. Did the estimate cover the "scope" of the program in review?

o. Did the estimate identify which cost elements were estimated and pass-throughs?

p. Did the estimate provide a cumulative distribution curve (S-curve)?

q. The IPAO cost estimate will submit an IPAO Sufficiency Review Report (see appendix A). The report will consist of::

- Executive summary (1-page) which will provide the cost estimate confidence level, via the Cost Readiness Level (CRL) and the rationale accompanying the assessment.
- Detail report

8.3 Risk-Related Questions (This list will be expanded as we gather more questions.)

8.3.1 Have costs for discrete, identified risks been captured?
8.3.2 How were inputs to cost-risk models (e.g., @Risk) developed?
8.3.3 Were engineers consulted in the definition of the level of risks?
8.3.4 Was CER, technical and correlation risk captured?
8.3.5 Was both probabilistic and discrete risk analysis performed?
8.3.6 Were the cost-risk distributions used justifiable?
8.3.7 Were provisions for unknown-unknowns made in the estimate?
8.3.8 Was schedule risk quantified along with cost-risk?
8.3.9 Can the cost-risk analysis answer the questions: How many dollars are included to cover discrete risks?
8.3.10 What are the risky WBS elements?
8.3.11 What is the likelihood of an overrun?

8.4 Risk Areas

8.4.1 Generally we experience the most risk in two areas: Analytical Error and True Risk. Both of these are measured against Cost Schedule and Technical Risks.

8.4.1.1 Analytical Error is defined as a Probability of error =/- X % and generally comes in the area of capacity of certain types of variables. (Perhaps from the history of performance of the contractor.)

8.4.1.2 True Risk relates to specific targest and skewed distributions that reflect a higher risk.

8.4.1.3 There is also such thing as the Risk matrices to which we refer as the Standard 5 by 5 Charts, and those type is ERASMUS.

8.4.1.4 An example of the Technical Risk is "If we don't meet the level of weight". Too much, and we can't fly.

8.5 Schedule related questions:

9.0 METRICS

10.0 OTHER DOCUMENTS, PROCEDURES OR FORMS RELEVANT TO THIS PROCEDURE

11.0 NECESSITY

11.1 The Cost Estimate Sufficiency Report (SR) is a review of the project for reasonableness, completeness, consistency, and compliance with generally accepted estimating processes. In the end, the result of the sufficiency report is to provide decision makers with an assessment on the quality of the cost estimate.

12.0 QUALITY RECORDS

13.0 FORMS

13.1 IPAO Cost Estimate Sufficiency Review Checklist (Version 1a)

13.1.1 **Appendix A: Part One** is the sample report.

13.1.2 **Appendix A: Part Two** is a list of detail questions and it will serve as a repository of other questions and "lessons learned" matters.

Appendix A

IPAO Cost Estimate Sufficiency Report (SR)

PART ONE:

Project Name:

IPAO Reviewer:

Purpose of the SR: (example) This SR was done in conjunction with the project NAR.

Executive Summary:

1. Cost Readiness Level (CRL) of the cost estimate:
2. Bullet summary of the SR.

PART TWO:

Detail report (the level depends on the scope of the cost estimate)

- Traceability. Assessment and justification.
- Reasonableness. Assessment and justification.
- Soundness. Assessment and justification.
- Verification. Assessment and justification.
- Validity. Assessment and justification.
- Accuracy/Consistency. Assessment and justification.
- Completeness. Assessment and justification.